SANYO

Service Manual

Biomedical Freezer

MDF-U5411

FILE No.

ＭＤＦ－Ｕ５４１１

SM9910028

Effective models

This service manual is effective following models.

Model	Product code	Voltage and Frequency	
MDF-U5411	823 171 51	110/115V	60Hz
	823 171 52	220V	50Hz
	823 171 54	230/240V	50Hz
	823 171 55	240V	50Hz
	823 171 56	230/240V	50Hz
	823 171 57	220V	50/60Hz
	823 171 58	240V	50Hz
	823 171 59	110/115V	60Hz

Features

■ Large effective capacity: 482L
280 FFP (fresh frozen plasma) bags (300mL) can be accommodated.

■ HFC refrigerant
Refrigerant circuit contains HFC refrigerant that effect to environment little.
Latest cooling system reduces negative factor to global environment. With ambient temperature at 30℃, while temperature of inside chamber maintains -40℃.

■ PCM structure
PCM structure reduces amount of organic solvent.

■ Temperature control function
New cooling system realizes to set -20℃, which is suitable for reagent preservation.

■ Specification unified
Unified specification for same categories, which also realized to unify performance for high/low temperature alarm (the available setting range is between +5℃ and +15℃ for high temperature alarm, －5℃ and －15℃ for low temperature alarm against the set temperature), power failure alarm, remote alarm terminal, setting memorization by non-volatile memory.
Adopt new microprocessor system for display panel and keypad makes operation easily.

■ Self diagnosis function
Abnormal condition for temperature sensor is indicated as E1/E2 by self-diagnosis system.

■ Ambient sensor adopted
For much better temperature distribution, by-pass circuit has adopted to control.

■ Validation
Control panel enable Zero “0” Adjust for validation.

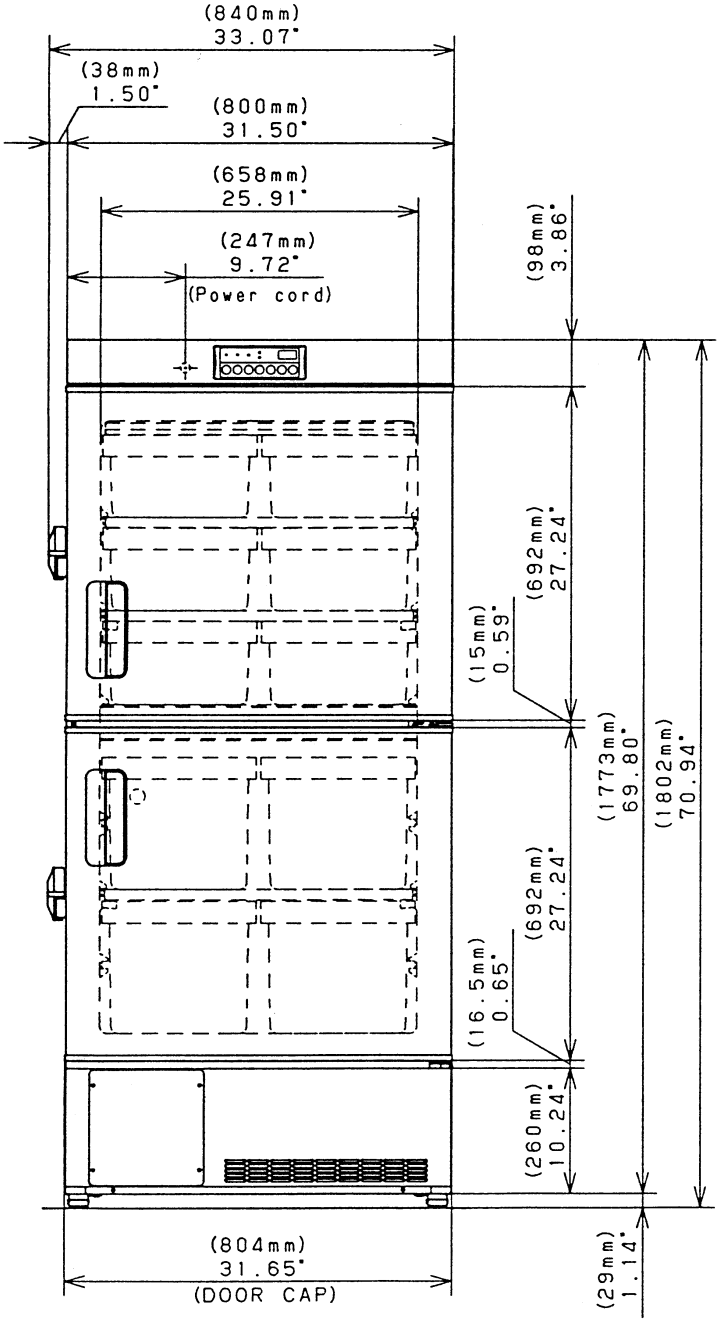
■ Compressor protection function
Sensor detects compressor’s warming up to control unit running.

Specifications

Item		Specification
Model description		Biomedical freezer
Model Number		MDF-U5411
Exterior dimensions		W 804 × D 772 × H 1802 mm
Interior dimensions		W 658 × D 607 × H 1272 mm
Effective chamber capacity		482 liters (17.0cu.ft)
Exterior cabinet		Polyester finish baked on zinc galvanized steel
Interior cabinet		Polystyrene resin
Outer door		2, Polyester finish baked on zinc galvanized steel
Door latch		2
Door lock		1
Cabinet insulation		Rigid polyurethane foam
Shelves		4, aluminum shelves (used as evaporator)
Access hole		ϕ 30mm, rear side
Caster		4
Leveling legs		2
Net weight		131 Kg
Evaporator		Tube on sheet type
Condenser		Wire and tube type
Compressor		350W hermetically sealed
Refrigerant		R-404A (HFC refrigerant)
Refrigerator oil		Ze-NIUS32SA
Accessories		Door lock key, defrost spatula 6 small baskets for upper room chamber (W290 x D536 x H136 mm) 4 large baskets for lower room chamber (W290 x D536 x H238 mm)
Power supply		Single phase, local voltage
Cooling performance		Internal 1/2h air: −40℃ (AT +30℃, no load, not exposed to direct rays of sun)
Internal temperature control range		−20℃～−40℃ (AT +5℃~+30℃, RH 80% or lower)
Temperature controller		Microprocessor controlled system with non-volatilized memory. Temp. set range : −18℃～−45℃ (unit by 1℃) SV can be stored for more than 10hours.
Temperature sensor		Thermistor sensor
Temperature display		LED digital display (green colored) , unit by 1℃. Range : −50℃～+50℃
Alarm	High/low temp.	±5℃～±15℃ adjustable. (Initial:±10℃) ALARM lamp brinks and intermittent buzzer beeps 15min. of delay
	Power failure	ALARM lamp brinks and intermittent buzzer beeps

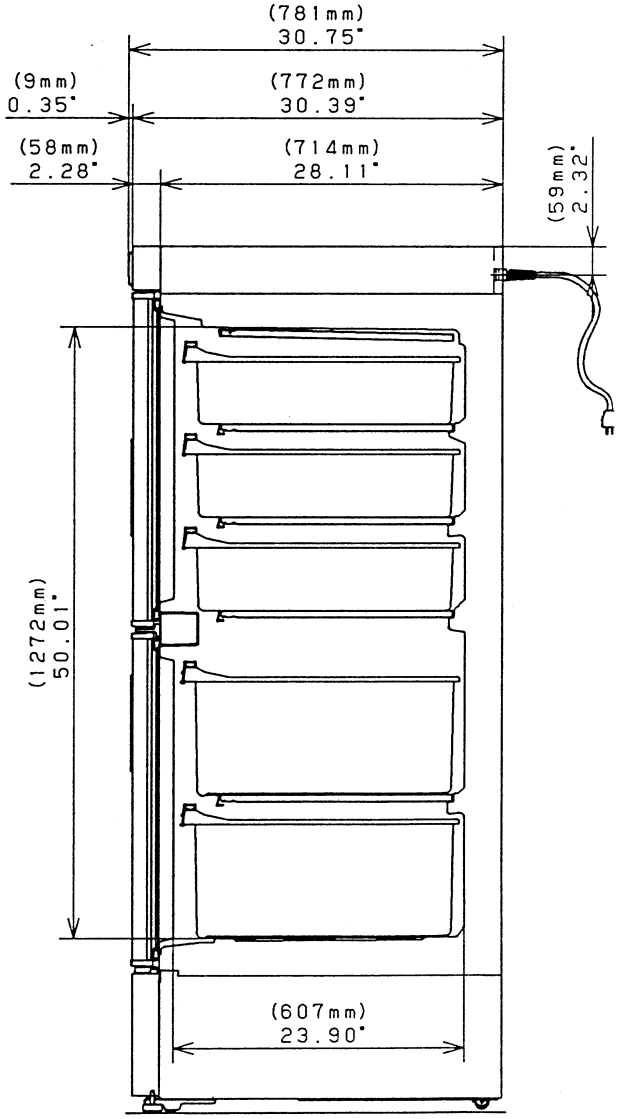
Operation panel	ALARM lamp blinks in temperature alarm BUZZER: Buzzer key ALARM TEST: Alarm test key SET: To switch the SV and PV ＞: To shift the set digit ∧: To change the SV DEF: Defrost key
Key lock function	Press ＞key for 5 seconds L0: Unlock L1: Lock
Remote alarm contact	DC30V, 2A, Normal-Open, temperature alarm & power failure alarm
Self diagnosis function	When each sensor is in fault: Error code and PV are displayed alternately.
Compressor protect sensor	Thermistor sensor
Optional component	Circular recorder: MTR-G85 Metal fittings for G85 circular recorder: MPR-S7

Dimensions



FRONT ELEVATION

SCALE 1" = 15"



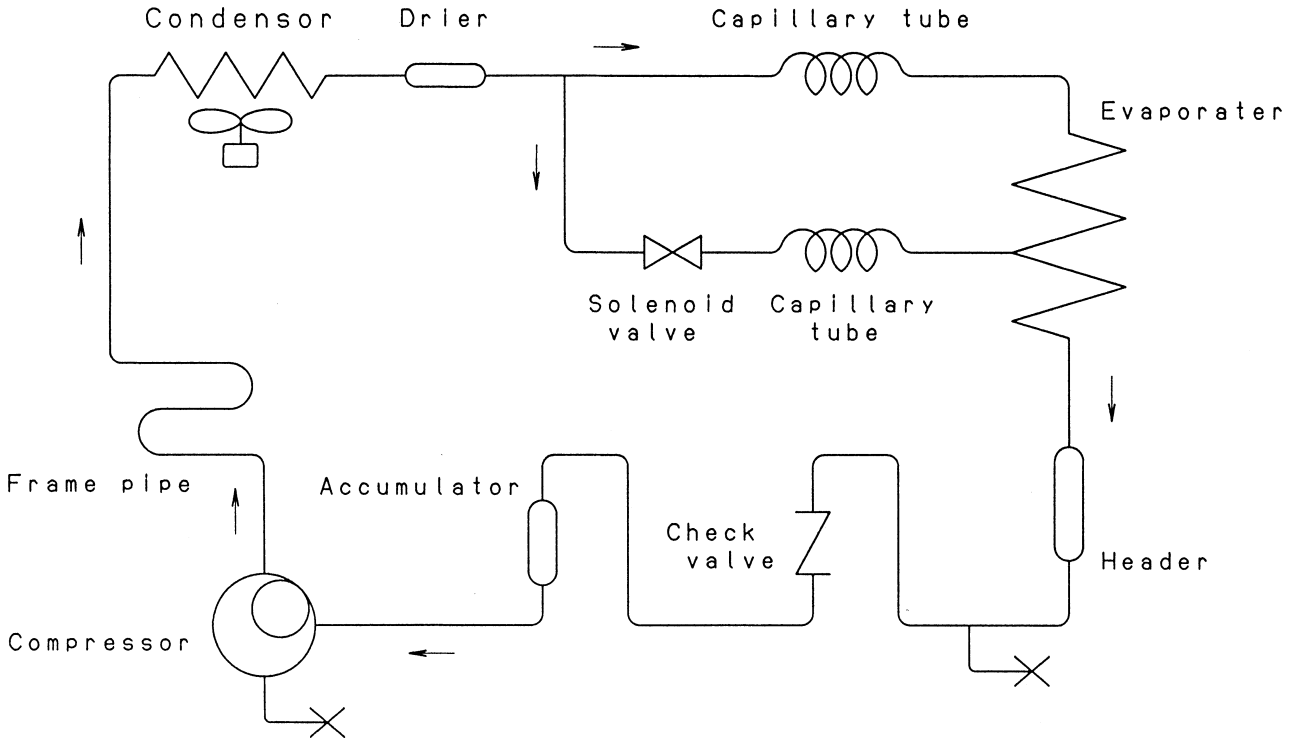
END SECTION

Refrigeration circuit

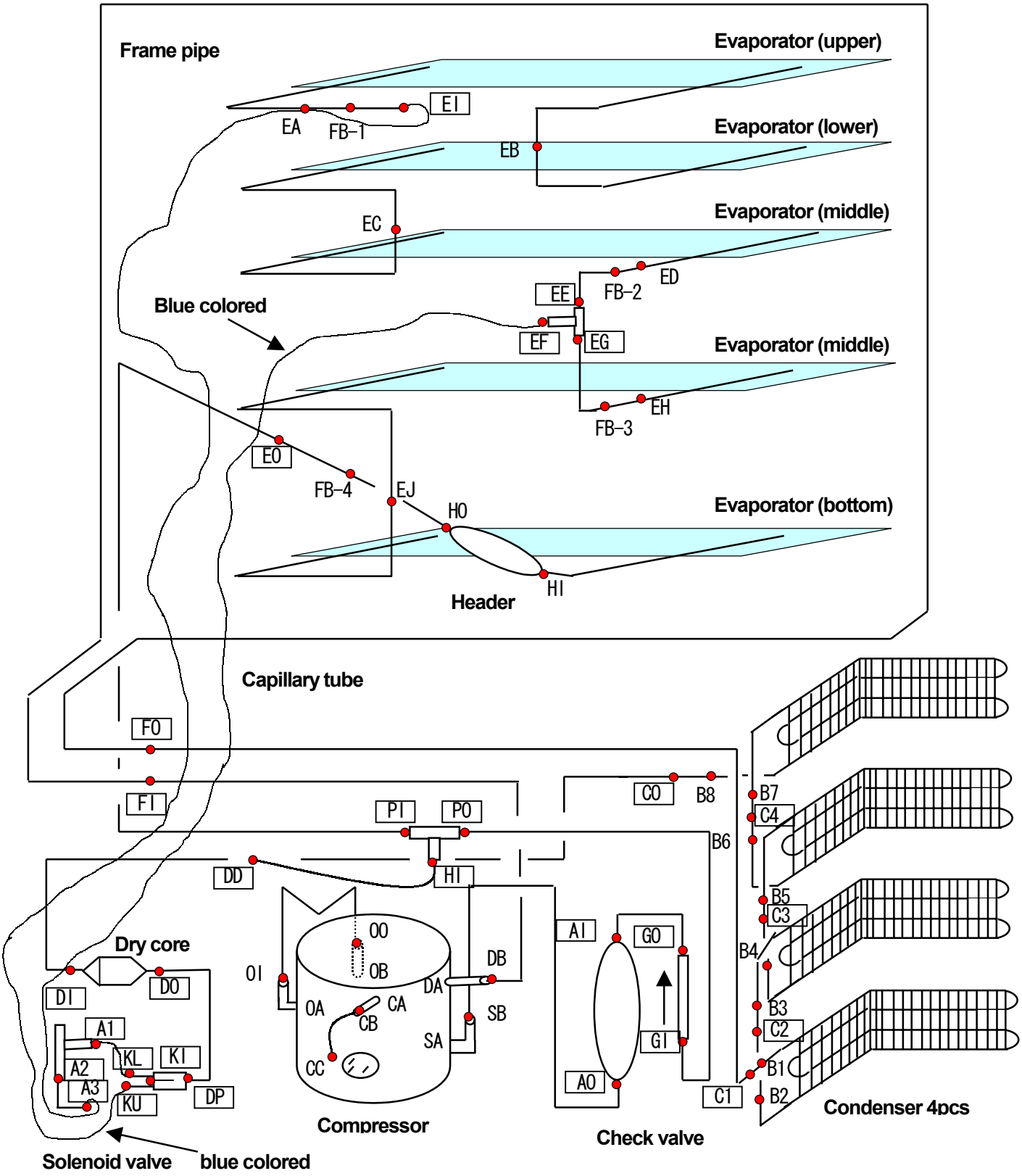
Unit: mm

Parts description	Specification	
Evaporator Upper (1), Middle (2), Lower (1), Bottom (3)	Type	9lines × 1column × 5pcs
	Material	Aluminum (ϕ 8.0)
Dry core	Type	D-S032T
	Solid core	50cm^2
Capillary tube (Total number: 2)	Resistance	0.725MPaG （7.4Kgf／cm^{2}G）
	Dimension	ϕ 1.8 × ^{L}4500
	Resistance indicator color	Blue
Condenser assembly front (Total number: 4)	Type	Wire and tube
	Dimension	^{W}480 × ^{P}40 × 6 columns
Frame pipe	Material	C1220T
	Dimension	ϕ 4.0 × ^{t}0.5 × ^{L}7470
Evacuation and vacuum pressure	Evacuation time: more than 20min. by 2 ports (high pressure and low pressure side). (N2 exchange) When charged, vacuum pressure is lower than 1.0torr （pump capacity：300L/min）	
Refrigerant and oil	Refrigerant： R-404A	Charged q'ty： 278±5g
	Oil： Ze-NIUS32SA	Charged q'ty : 280±10cc
	Oil additive: n-pentane	Charged q'ty: 19cc (11.6g)

Refrigeration circuit principle diagram



Refrigeration circuit welding points



Electrical Parts

MDF-U5411		AC110V/115V, 60Hz	AC220V, 50/60Hz	AC230V/240V, 50Hz
Compressor	Type	C-2SN350L0R	C-2SN350L5S	C-2SN350L5S
	Code	807 764 20	807 763 25	807 763 25
	Rated voltage (50/60Hz)			
	Winding resistance C-S(Aux)	5.8Ω	30.6Ω	30.6Ω
	C-R(Main)	1.6Ω	7.8Ω	7.8Ω
Starting relay	Type	AMVL-180A	AMVL-300A	AMVL-300A
	Pick up voltage	AC91V~111V	AC185V~217V	AC185V~217V
		AC108V~128V	AC215V~232V	AC215V~232V
	Drop out voltage	AC30~65V	AC60~120V	AC60~120V
		AC30~75V	AC69~132V	AC69~132V
Overload relay	Type	P18AU	P10MU	P10MU
	Action to the temp. (No current)			
	OFF	120±8℃	130±8℃	130±8℃
	ON	69±10℃	69±10℃	69±10℃
	Action to the current (AT25℃)	18.5A	10A	10A
	Operation time	6~15seconds	6~15seconds	6~15seconds
	Non-Action to the temp. (80℃)			
	Non-Action	4.0A more than 30minutes	2.5A more than 30minutes	2.5A more than 30minutes
	Action	5.5A within 15minutes	3.4A within 15minutes	3.4A within 15minutes
Starting capacitor	Rating	100μF, 160VAC	30μF, 300VAC	30μF, 300VAC
Running capacitor	Rating	25μF, 220VAC	5μF, 400VAC	5μF, 400VAC
Compressor relay	Type	G4F-11123T	G4F-11123T	G4F-11123T
	Contact capacity	AC220V, 20A	AC220V, 20A	AC220V, 20A
	Coil	DC12V	DC12V	DC12V
Temp. control relay	Type	G2R-1A-T	G2R-1A-T	G2R-1A-T
	Contact capacity	AC250V, 10A	AC250V, 10A	AC250V, 10A
	Coil	DC12V	DC12V	DC12V
Switching power supply	Type	ZWS10-12/J	ZWS10-12/J	ZWS10-12/J
	Input	AC100-240V 50-60Hz, 0.3A	AC100-240V 50-60Hz, 0.3A	AC100-240V 50-60Hz, 0.3A
	Rated output	DC12V, 0.85A	DC12V, 0.85A	DC12V, 0.85A
Temperature sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5KΩ, 25℃	5KΩ, 25℃	5KΩ, 25℃
Solenoid valve control sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5KΩ, 25℃	5KΩ, 25℃	5KΩ, 25℃
Compressor protect sensor	Type	502AT-1	502AT-1	502AT-1
	Rating	5KΩ, 25℃	5KΩ, 25℃	5KΩ, 25℃
PCB	Type	DF-5411	DF-5411	DF-5411
Battery	Type	5HR-AAC	5HR-AAC	5HR-AAC
	Rating	6V 1100MAH	6V 1100MAH	6V 1100MAH
Battery switch	Type	SLE6A2-5	SLE6A2-5	SLE6A2-5
	Rating	AC250V 4A	AC250V 4A	AC250V 4A
Breaker switch	Type	BAM215131	BAM215131	BAM215131
	Rating	AC250V 15A	AC250V 15A	AC250V 15A
Solenoid valve coil (2pcs)	Type Rating	NEVAC120V 120V 50/60Hz	NEVAC220V 220V 50/60Hz	NEVAC240V 240V 50/60Hz
Condensing fan motor	Type	FU2-A051B1MP	FU2-A051B5MP	FU2-A051B5MP
	Rating	AC110-115V 50/60Hz	AC220-240V 50/60Hz	AC220-240V 50/60Hz
	Thermal fuse	130℃	130℃	130℃

Specifications of sensor

The following shows temperature and resistance characteristics on each thermistor sensor (type 502AT-1).

Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)	Temperature (℃)	Resistance (kΩ)
−50	154.50	−7	17.92	12	8.17
−45	116.50	−6	17.16	13	7.85
−40	88.85	−5	16.43	14	7.55
−35	68.15	−4	15.74	15	7.27
−30	52.84	−3	15.08	16	6.99
−25	41.19	−2	14.45	17	6.73
−20	32.43	−1	13.86	18	6.48
−19	30.92	0	13.29	19	6.24
−18	29.50	1	12.74	20	6.01
−17	28.14	2	12.22	25	5.00
−16	26.87	3	11.72	30	4.18
−15	25.65	4	11.25	35	3.51
−14	24.51	5	10.80	40	2.96
−13	23.42	6	10.37	45	2.51
−12	22.39	7	9.96	50	2.14
−11	21.41	8	9.57	55	1.83
−10	20.48	9	9.20	60	1.57
−9	19.58	10	8.84		
−8	18.73	11	8.49		

Control specification

1. Keys and switches

BUZZER — When ALARM lamp is blinking and buzzer beeps, buzzer and remote alarm output are forcibly turned off.
When the value except for 000 is set in F25 (alarm auto recovery time setting), buzzer is triggered again after the specified setting time has passed.
During ALARM TEST, buzzer is not silenced by BUZZER key pressed.
When ALARM lamp is blinking and buzzer is silence, buzzer does not activate.
Pressing this key during power failure, current internal temperature(PV) is displayed for 5seconds.

SET — Once the key is pressed, temperature setting mode is led.
Pressing this key again to store the setting value.

DEF — In PV display, keep pressing the key over 5seconds to start defrost. (Refrigerating operation is stopped)
During defrost is performing, press the key to quit defrosting.
During defrost is performing, PV and “dF” are displayed alternately.
During defrost is performing, high/low temperature alarm is cancelled.
When a sensor error is occurred during defrost, error code and PV are displayed alternately, instead “dF” is not appeared on the display.
During defrost is performing, BUZZER key is solely available.

ALARM TEST — In PV display, press the key to perform ALARM TEST.
Press this key to stop ALARM TEST performing.
During ALARM TEST, ALARM lamp is blinking, buzzer is beeping intermittently and digital temperature display is turned off.
During ALARM TEST, any keys are inoperative.

⏩ — During setting mode, device can be shift between the 1st digit and the 2nd digit by this key. In PV display, keep this key pressing over 5seconds to be key lock mode available. (“L0” is displayed)

⏫ — During setting mode, blinking digit counts up by the key pressed.
In PV display, keep the key pressing over 5seconds to be function mode available. (“F00” is displayed)

2. Temperature control and temperature alarm

<Temperature control>

Setting range: −18℃~−45℃
Display range: −50℃~+50℃
Setting method: Press SET key and set the desired value with ⏫ key and ⏩ key.
Press SET key again to store the setting value.
Setting mode returns to PV display.
Out of setting range: If a value is set out of the setting range and SET key is pressed, buzzer beeps for 1second to store previous setting value.

<Temperature alarm>

High: When the internal temperature is higher than SV (＋5℃~＋15℃), ALARM lamp and digital display are blinking. After 15min. later, buzzer will beep and remote alarm contact will turn on. (initial: ＋10℃)

Low: When the internal temperature is lower than SV (－5℃~－15℃), ALARM lamp and digital display are blinking. After 15min later, buzzer will beep and remote alarm contact will turn on. (initial: －10℃)

Setting method: Keep ⏫ key pressing over 5seconds to be function mode available. ("F00" is displayed) Then press ⏫ key to count value up. Set "F01" to input value for high temperature alarm, "F02" to input value for low temperature alarm.
Set "F01" or "F02" then press SET key to be alarm temperature setting mode available. Set desired value with ⏫ key and ⏭ key.
Press SET key again to store the value.

Out of setting range: If a value is set out of setting range and SET key is pressed, buzzer beeps for 1second to store the previous setting value.

3. Defrosting

In PV display, keep DEF key pressing over 5seconds, defrost operation starts. Compressor and solenoid valve are forcibly turned off.
Press DEF key again to quit defrosting. (Manual start and end)
While the refrigerating operation is stopped, the current chamber temperature and "dF" is displayed on the control panel alternately

4. Self diagnosis function

E01: Temperature control sensor is open circuit
E02: Temperature control sensor is short circuit
E03: Unassigned
E04: Unassigned
E05: Compressor protect sensor is open circuit
E06: Compressor protect sensor is short circuit
E07: Unassigned
E08: Unassigned
E09: Buttery switch is left turned on
E10: Compressor temperature is abnormal
E11: Solenoid valve control sensor is open circuit
E12: Solenoid valve control sensor is short circuit

When temperature control sensor is open circuit, E01 and －50℃ are displayed alternately.
When temperature control sensor is short circuit, E02 and ＋50℃ are displayed alternately.

Error diagnosis:

If the temperature is lower than –60℃, it regards as “open circuit”.
If the temperature is higher than +60℃, it regards as “short circuit”.
E09 diagnosis is done only during ALARM TEST is performed.
In E10, it diagnoses as abnormal when condenser temperature is higher than +85℃. When condenser temperature is higher than +100℃, compressor is forcibly turned off. When condenser temperature is lower than +65℃, it diagnoses as normal and cancel forcible compressor turning off.
When numbers of error happened simultaneously, error code of smallest numerical digit is indicated. However, both E11 and E12 take priority over any other error codes.
During power failure, E09 and blank are indicated.

5. Key Lock function

In PV display, keep ⏩ key pressing over 5seconds to be Key Lock mode available. At the time “L0” is displayed.
Press ⏫ key to display “1” … Key Lock ON
“0” … Key Lock OFF
Then press SET key to store setting value and revert to PV display.

Note) With Key Lock ON, SET mode is led but the value cannot be changed.
With Key Lock ON, either Function or ALARM TEST is performed, while DEF is not performed.

6. Power failure alarm

(Buzzer does not beep and indication does not appeared without power supplied by buttery)
When power failure is occurred, power failure alarm will be triggered by built-in buttery. During power failure alarm, alarm lamp is blinking, digital display turns off, buzzer beeps intermittently and remote alarm contact turns on. Press BZ key to turn power failure alarm buzzer off. Press BZ key to display PV for 5seconds.
During power failure alarm, BZ key is solely available.

7. ALARM TEST function

The function is to check performance (failure) for ALARM lamp, buzzer and remote alarm. In PV display, press ALARM TEST key to blink ALARM lamp, to beep buzzer intermittently, to turn remote alarm on (without delay). Digital display will be turned off. During ALARM TEST, ALARM TEST key is solely available.

Note) During ALARM TEST, error code E09 is indicated if buttery switch is turned off. Displaying error code E09 takes priority over other error code that has indicated before ALARM TEST is performed.

8. Auto Return function

During setting mode or Key Lock mode or Function mode, if any key is not pressed in 90seconds or more, setting value is not stored and automatically reverts to PV mode.

Note) In F09 and F10 (Line Test mode), Auto Return is not performed.

9. Compressor delay time

During normal cycle operation, compressor is forcibly turned off for 2minutes after the compressor was turned off.
When main power is supplied (microcomputer is RESET), compressor delay time is changeable to 1~15minutes. (See F05)

10. Function mode

F00: Simply reverts to PV display.
F01: High temperature alarm setting value is changed
F02: Low temperature alarm setting value is changed
F03: Unassigned. Simply reverts to PV display.
F04: Unassigned. Simply reverts to PV display.
F05: Compressor delay time is set
F06: Service code input (code:384)
F07: Temperature sensor Zero Adjustment (±9.9℃ by differential input)
F08: Unassigned. Simply reverts to PV display.
F09: Unassigned. (Factory test mode)
F10: Unassigned. (Factory test mode)
F11: Unassigned. Simply reverts to PV display.
F12: Temperature in temperature sensor is displayed (unit:0.1℃)
F13: Temperature in compressor protect sensor is displayed (unit:1℃)
F14: Unassigned. Simply reverts to PV display.
F15: Temperature in solenoid valve control sensor is displayed (unit:1℃)
F16: Unassigned. Simply reverts to PV display.
F17: A model code setting 004:MDF-U5411 (001~003: Unavailable)
F18: Preset value for secondary offset is displayed: －20.0℃~－40.0℃
F19: Unassigned. Simply reverts to PV display
F20: Unassigned. Simply reverts to PV display
F21: Communication ID setting (000~255)
F22: Communication mode setting
F23,24,26~29: When an each function code among F23, 24, 26~29 is input and SET key is pressed, buzzer beeps for 1second to keep the status.
F25: Alarm Ring Back time setting (000, 010, 020, 030, 040, 050, 060)

Setting method: In PV display, keep ⏫ key pressing over 5seconds to be Function mode available. At the time “F00” is displayed. Press ⏫ key to input desired function code then press SET key.

F00: Unassigned. In F00 is displayed, press SET key to revert to PV display.

F01: High temperature alarm setting value can be set in the range ＋5℃ ~＋15℃. (initial: ＋10℃)

F02: Low temperature alarm setting value can be set in the range －5℃ ~－15℃. (initial: －10℃)

F05: Compressor delay time setting (This mode is assigned only in the main power supplied or microcomputer reset)
The function is assigned to reduce the compressor starting-up malfunctions or the breaker blown outs when numbers of product start-up simultaneously after a power failure occurred. The delay time can be set by 1~15minutes. Initial setting is 1minute.
1minute for initial setting is stored in the memory after F10 (Line test mode) is performed. The delay time is set by 3seconds prior to F10 is performed. When the PCB is changed on servicing, the delay time is also 3seconds.

F06: When F07 or larger numerical mode is performed, input following service code with ⏫ key and ⏩ key. Press SET key to store the service code to be the function mode available.
Service code: 384

Note) Service code is stored unless "000" is input in F06 or the power is turned off (buttery switch and power supply are turned off)

F07: Temperature sensor Zero Adjustment (setting range: −9.9℃~+9.9℃)
In F07 is displayed, press SET key to display "00.0" (initial value).
Set value with ⏫ key and ⏩ key, and press SET key again to store the value. Differential input should be done.

Ex) When the 1/2h actual temperature is –28.5℃ and digital display is −30℃, add +1.5 to value in F07.
Calculation = (−28.5−(−30)) =+1.5

In the 1st digit and the 1st decimal place, the device is changeable to "0"~"9" with ⏫ key, but only "0" and "-" are changeable in the 2nd digit.
With ⏫ key, the device can shift the 2nd digit ⟷ the 1st digit ⟷ the 1st decimal place ⟷ the 2nd digit.

F12: Temperature in temperature sensor is displayed. (Unit: 0.1℃)
From the 2nd digit to the 1st decimal point is shown in the display.
It is not shown "-" in the display when temperature is lower than −20℃.
(Ex. Actual temperature −35℃ → Display shows 35.0℃)
It is shown "-" in the range of −19.9℃~−0.1℃.
Display range: −72.0℃~+83.0℃(±9.9℃)

F13: Temperature in compressor protect sensor is displayed. (unit:1℃)
Display range: −72℃~+163℃

F15: Temperature in solenoid valve control sensor is displayed. (unit: 1℃)
Display range: −72℃~+163℃

F17: Model code setting
004: MDF-U5411

Initial setting values are as follow:
Internal chamber temperature: －40℃
Key Lock mode: 0 (OFF)
High temperature alarm: SV＋10℃
Low temperature alarm: SV－10℃
Zero Adjustment: 0℃
Compressor delay time: 0minute
Communication ID: 000
Communication mode: 000
Alarm Ring Back time: 030 (30minutes)

F18: Preset value for secondary offset is displayed: －20.0℃~－40.0℃

F21: Serial communication ID setting
Input range: 000~255 (“000” means communication is OFF)

F22: Serial communication mode setting
Control mode (3rd digit) 0: Local (initial)
1: Remote
Baud rate (2nd digit) 0: 2400 bps (initial)
1: 4800 bps
2: 9600 bps

Note) If control mode is set at “Remote”, the SV cannot be changed and defrost cannot be performed.

F25: Alarm Ring Back time setting
Input range: (000, 010, 020, 030, 040, 050, 060)
(In “000”, recovery function is inoperative)

11. Differential The programmatic point to turn compressor on/off
COMP ON: Activate in SV or higher
COMP OFF: Activate in SV－0.6℃ or lower

12. Display offset

Display offset should be done because a temperature that is lower than SV is less displayed.
－0.5℃ offset from temperature displayed (round off numbers to the first decimal point)

13. Remote alarm

Remote alarm contact: Normal … Open
In alarm or power failure … Close

14. Solenoid valve control

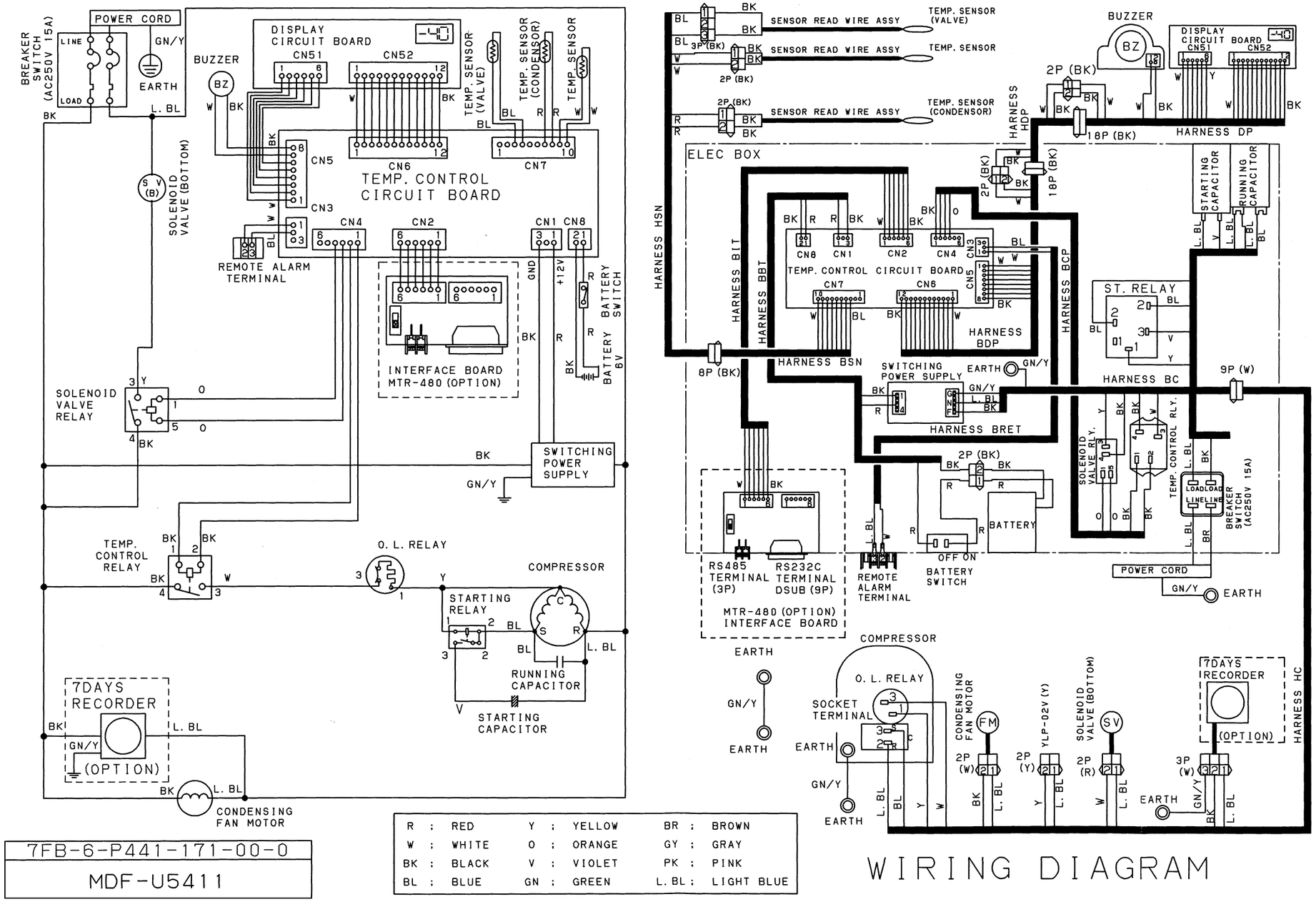
A preset value for solenoid valve control (SVv) is changed when ambient temperature (PVv) is as follow:

PVv≦18.0℃	SVv=－40℃
18.0＜PVv＜55.0℃	SVv=0.6×PVv－51
PVv≧55.0℃	SVv=－20℃

Solenoid valve on/off control should be done in compare above SVv with internal set temperature (SVk). This comparison should be done in every 30minutes.
When the power is supplied, SVv is －30℃. The first comparison should be done in 1minute after the power supplied.
In SVk≧SVv, solenoid valve on/off control (simultaneously with compressor) is done.
In SVk＜SVv, solenoid valve is forcibly off.

Note) Internal temperature will not reach to SV if solenoid valve is left opened when ambient temperature is high. Preset value should be used to control solenoid valve.

Wiring diagram



R	: RED	Y	: YELLOW	BR	: BROWN
W	: WHITE	O	: ORANGE	GY	: GRAY
BK	: BLACK	V	: VIOLET	PK	: PINK
BL	: BLUE	GN	: GREEN	L. BL	: LIGHT BLUE

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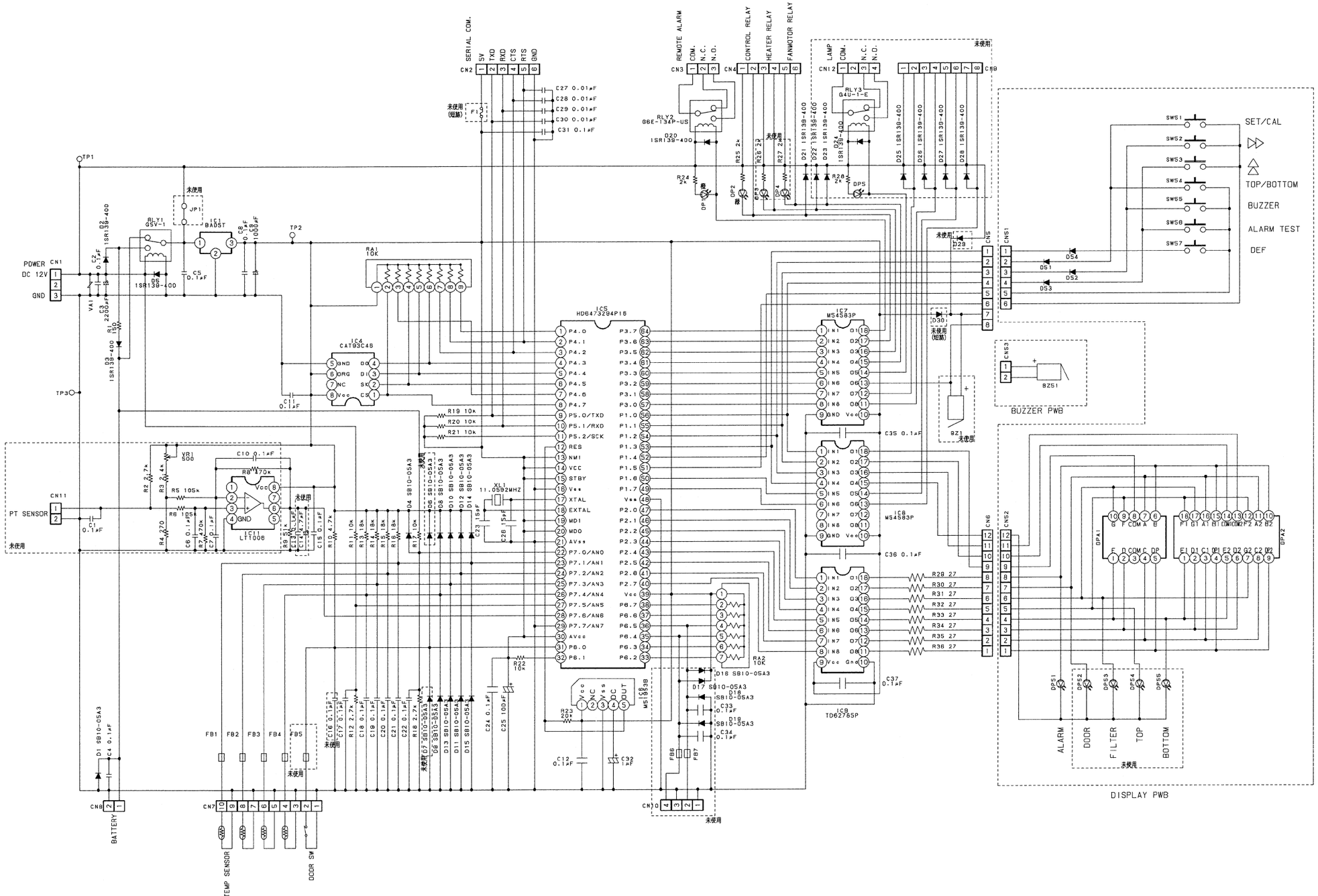
MDF-U5411

WIRING DIAGRAM

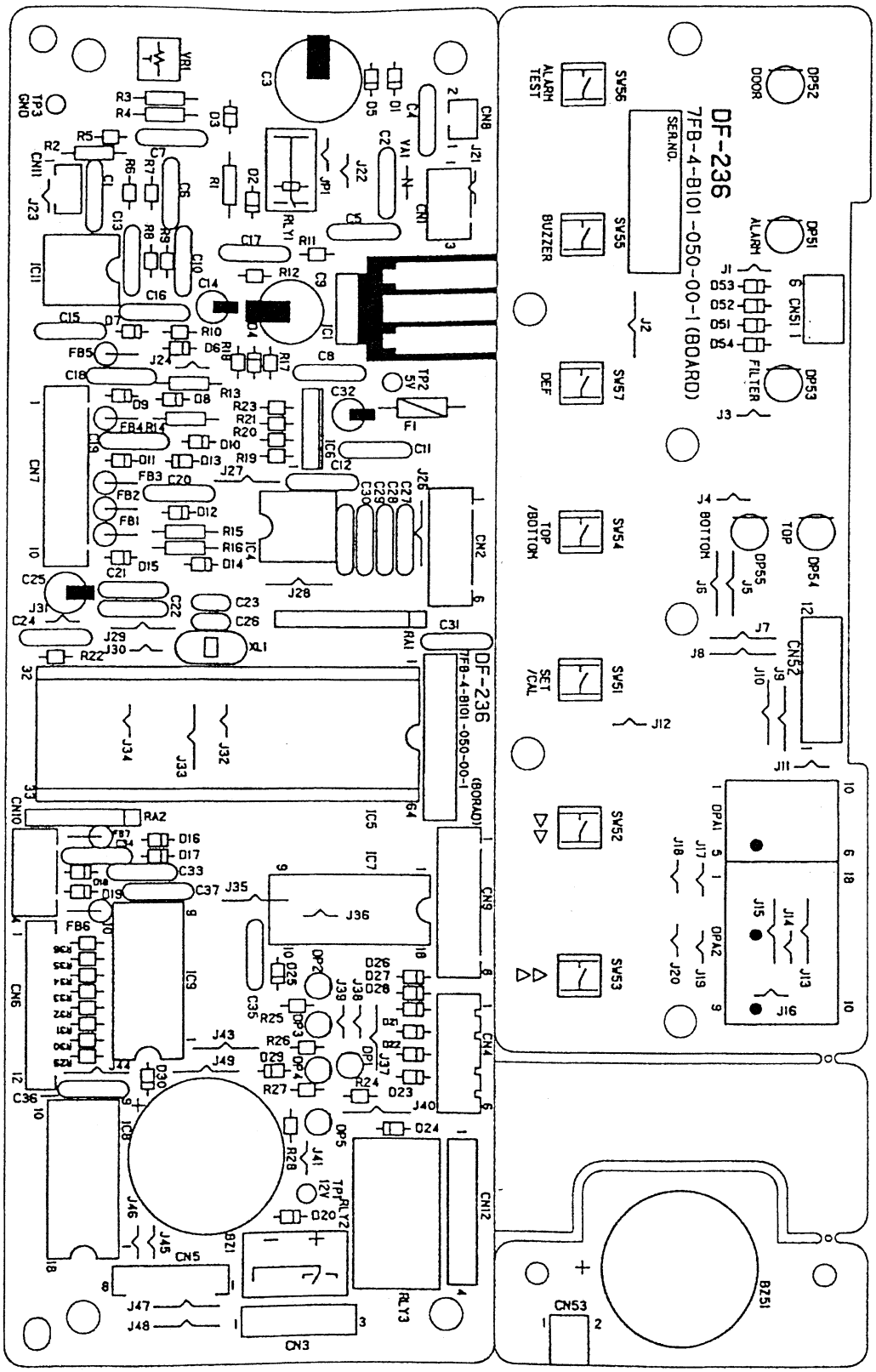
Circuit diagram

<Main PCB>



Components on PCB

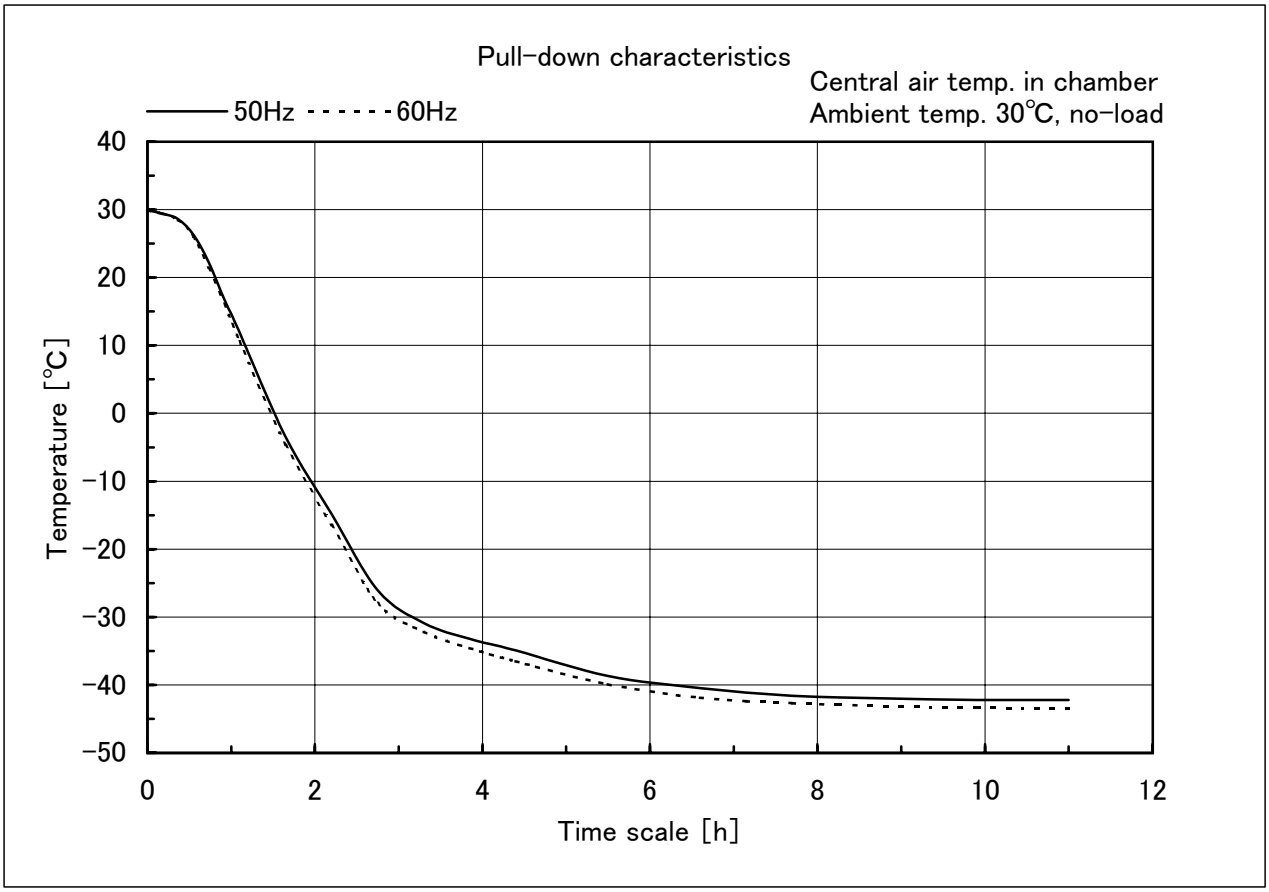
<Main PCB>

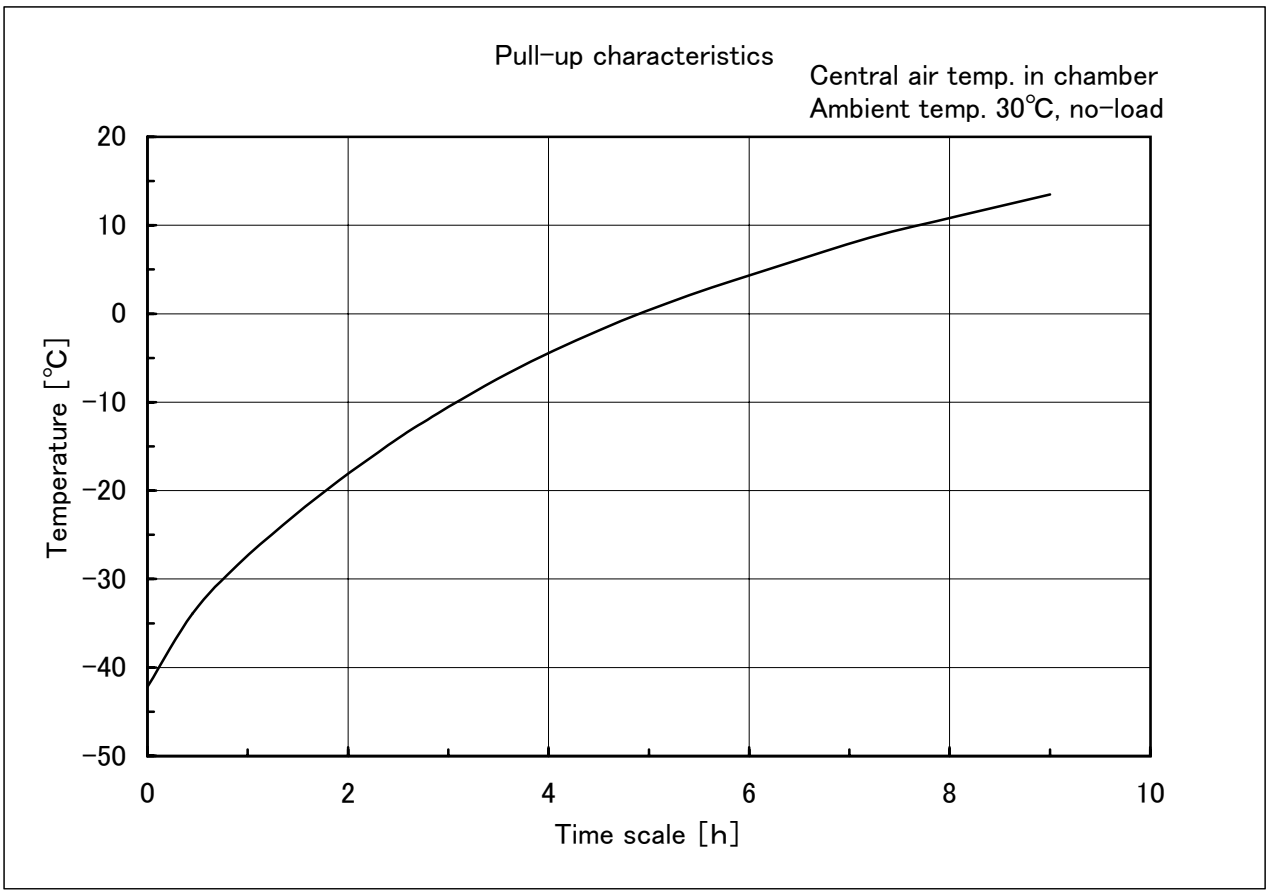


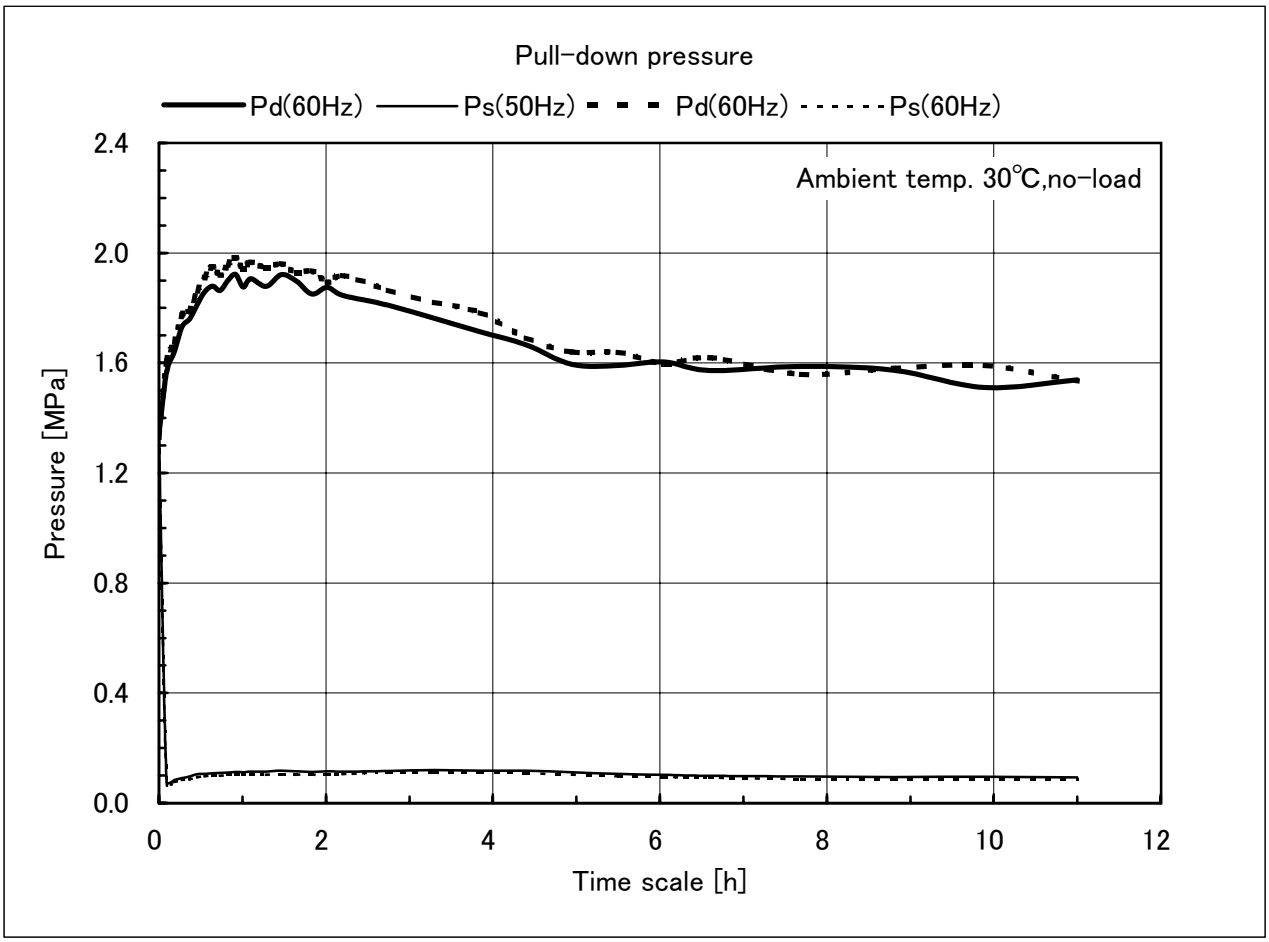
Test data

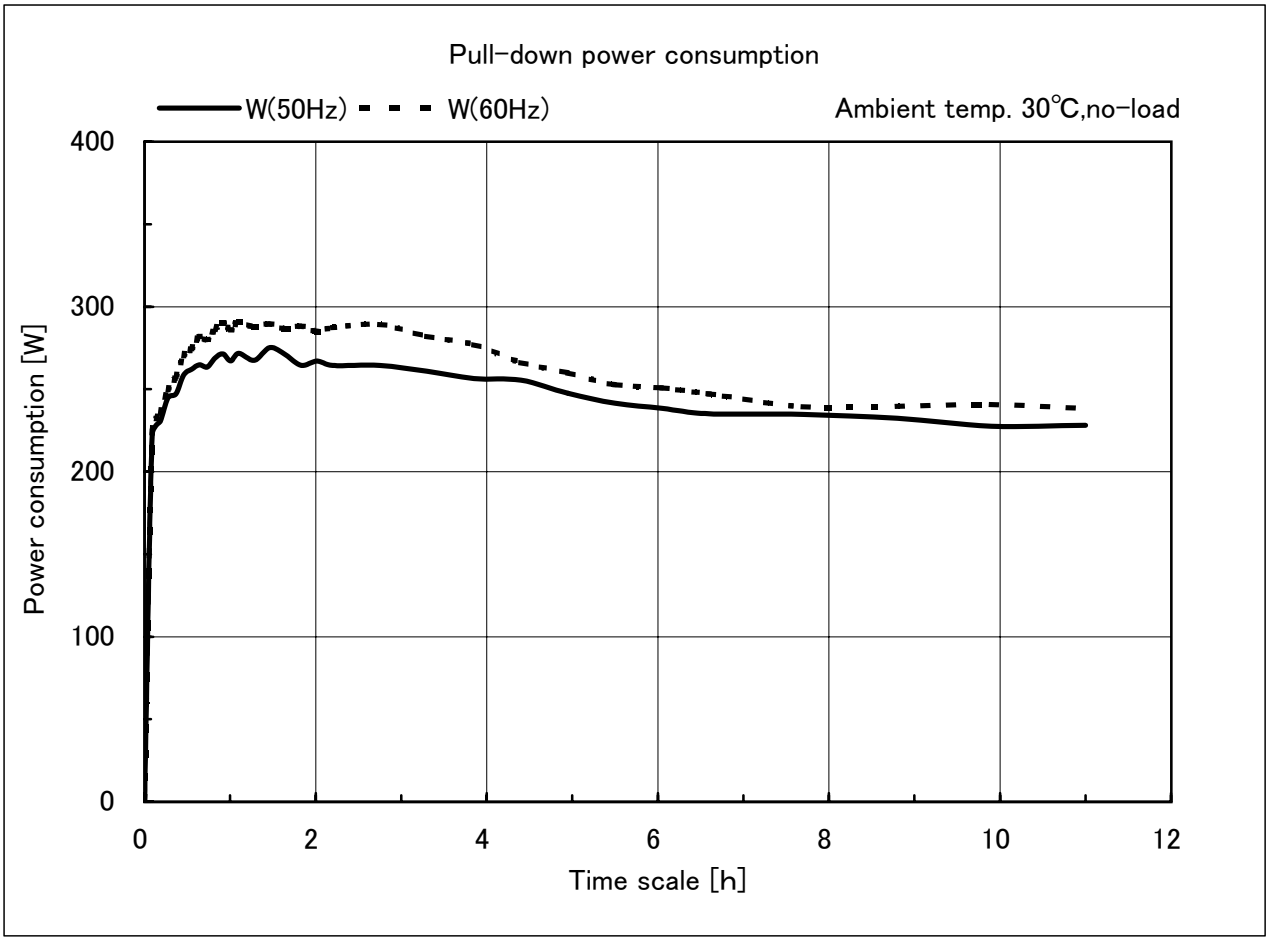
1. MDF-U5411

①Pull-down, pull-up characteristics
②Pull-down characteristics (pressure)
③Pull-down characteristics (consumption)
④Temperature uniformity and fluctuation


Pull-down characteristics
Central air temp. in chamber
Ambient temp. 30℃, no-load
50Hz
60Hz
Temperature [℃]
40
30
20
10
0
-10
-20
-30
-40
-50
0
2
4
6
8
10
12
Time scale [h]

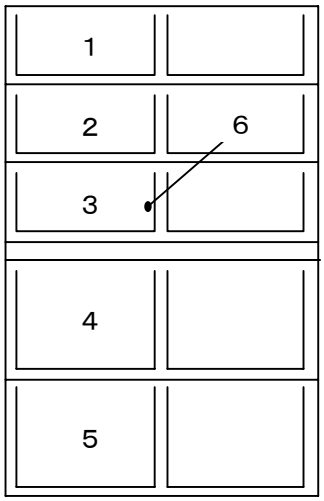

Pull-up characteristics
Central air temp. in chamber
Ambient temp. 30℃, no-load
Temperature [℃]
20
10
0
-10
-20
-30
-40
-50
0
2
4
6
8
10
Time scale [h]


Pull-down pressure
Pd(60Hz)
Ps(50Hz)
Pd(60Hz)
Ps(60Hz)
Ambient temp. 30℃,no-load
Pressure [MPa]
2.4
2.0
1.6
1.2
0.8
0.4
0.0
0
2
4
6
8
10
12
Time scale [h]


Pull-down power consumption
W(50Hz)
W(60Hz)
Ambient temp. 30℃,no-load
Power consumption [W]
400
300
200
100
0
0
2
4
6
8
10
12
Time scale [h]

MDF－U5411　temperature uniformity and fluctuation

Ambient temp. :30℃
Measureing point:Center point of each container/chamber
No load, Measure with type T sensor



	SV −20℃	SV −30℃	SV −35℃	SV −40℃
1	−19.0	−27.9	−32.8	−37.2
2	−20.7	−30.0	−35.0	−39.8
3	−21.1	−30.7	−35.9	−40.6
4	−20.6	−30.0	−35.1	−39.9
5	−19.9	−29.0	−33.5	−38.1
Uniformity [deg.]	2.1	2.8	3.1	3.4
6	−20.9	−30.5	−35.6	−40.4
Fluctuation [deg.]	±1.3	±1.0	±1.1	±1.0

note) These data are reference only

Instruction manual

・This section is extracted and printed from Instruction Manual.

・If you find out “Refer to page ●●” in them, this page means not page in service manual but page in the lower corner of each page in the extract from Instruction Manual.
This page number is not corresponded with serial number in Service Manual.

SANYO

INSTRUCTION MANUAL

MDF-U5411

BIOMEDICAL FREEZER